

Karst of the Western Delaware County, Ohio, Region

by

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Richard R. Pavey, D. Mark Jones, Dean R. Martin,
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Karst terrain forms by dissolution of carbonate rocks (e.g., limestone or dolomite) and occasionally evaporites (e.g., gypsum or salt) and is characterized by features such as sinkholes, disappearing streams, caves, and springs. The many passageways formed in karst terrain allow for high connectivity between the land surface and the water table and can bypass soil and rock layers that filter out contaminants. Consequently, when compounds such as fertilizers, pesticides, and waste enter sinkholes, they are rapidly transported to the water table and quickly pollute water wells, streams, and rivers. Karst also poses infrastructure complications: roads, utilities, houses, and other facilities built in karst areas are at risk of subsidence, collapse, or other damage.

Karst areas have been studied in Ohio for many years. In the 1980s and 1990s, karst was researched for the proposed Superconducting Super Collider and mapped statewide to determine areas suitable for storage of low-level nuclear byproducts. Ohio's preliminary map of karst features was completed in 1997 and released in 1999; it since has been updated with new data in 2003, 2005, and 2007 and soon will be updated again. In the spring of 2008, severe karst-related flooding occurred in Bellevue leading to additional research and increased concern regarding Ohio's geohazards. Finally in the fall of 2008, the Ohio Department of Natural Resources (ODNR), Division of Geological Survey met with the Delaware Soil and Water Conservation District and the Upper Scioto River Watershed Project to discuss mutual projects involving karst features in the Scioto River corridor in Delaware County. Rapidly developing and known to contain karst, this area is close to both the ODNR Division of Geological Survey's main office and its H. R. Collins Laboratory at Alum Creek State Park, thus field verification was easily accomplished while sinkhole-locating methods were refined.

To locate sinkholes, LiDAR (Light Detection And Ranging) was used to create a map layer that identified low, enclosed areas. These low spots were cross referenced with known karst points, bedrock geology, aerial photography of multiple sources and ages, soil maps, drift thickness, and water well logs to locate

potential sinkholes. Suspect locations then were visited in the field, evaluated, and photographed. Through this process we quickly learned that many of the LiDAR returns were not sinkholes; features such as building foundations, broken field tile, steep-walled streams, and road culverts often produced enclosed areas similar in shape to sinkholes. Many of these features were eliminated using both 6-inches-per-pixel aerial photography and experience from field verification. The resulting map, which is divided into 255 two-km² tiles, of which 35 tiles contain sinkholes, identifies about 400 sinkholes. The map and related collection of photographs can be used to monitor the growth of preexisting sinkholes and development of new karst features. Furthermore, areas of land development should be carefully planned in regions of dense karst since they are highly susceptible to pollution and subsidence.

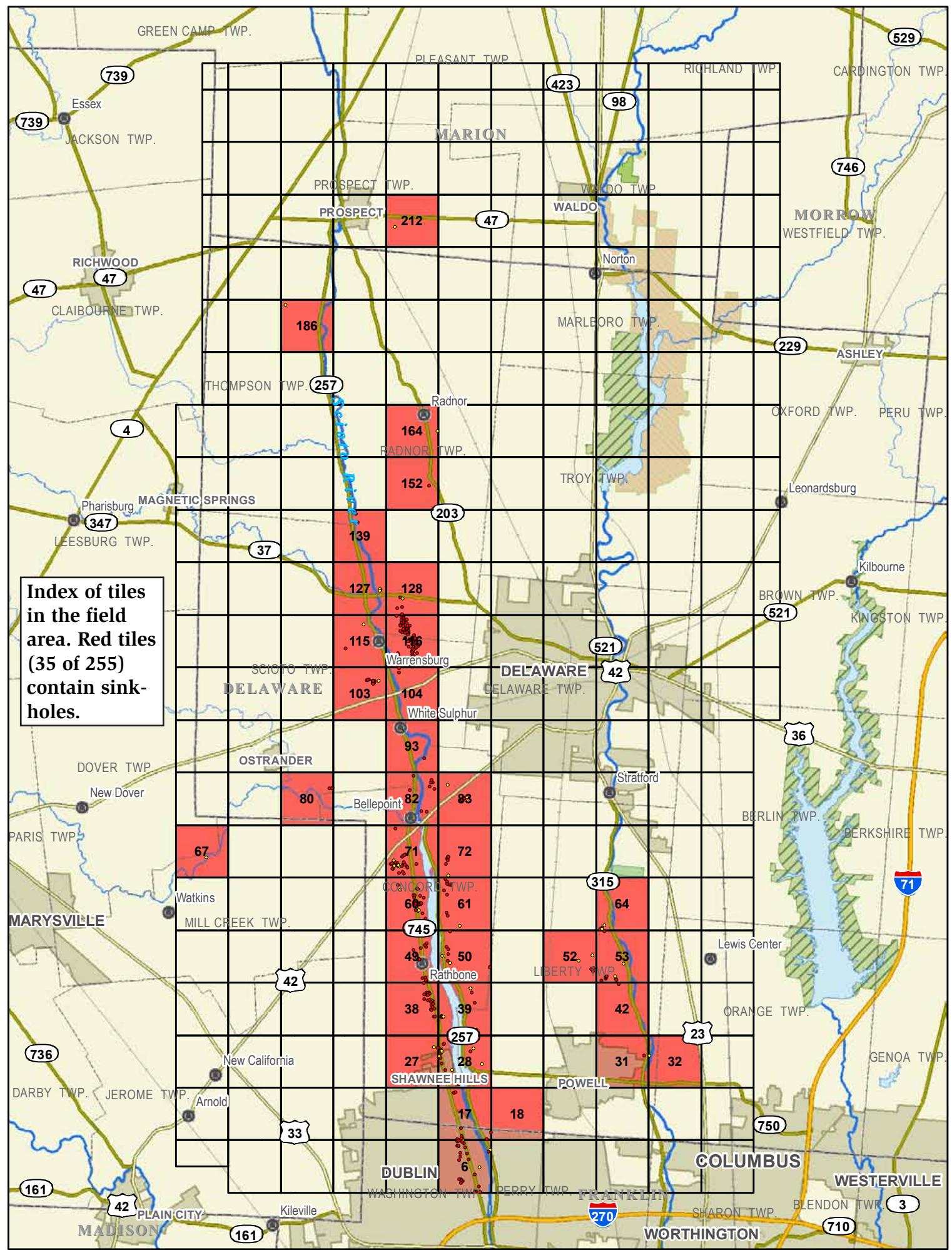
The following documents provide additional information on karst and its effects in Ohio and beyond.

ODNR

- ◆ “Revised Ohio Karst Map Helps Homeowners, Developers and Land-use Planners Define Areas of Possible Groundwater Pollution and Unstable Terrain,” press release dated October 30, 2007, accessible at <http://ohiodnr.com/home_page/NewsReleases/tabid/18276/EntryId/204/10-29-07-Revised-Ohio-Karst-Map.aspx> .
- ◆ *Ground Water Induced Flooding in the Bellevue Ohio Area, Spring and Summer 2008*, ODNR Division of Water Technical Report of Investigation 2009-1, accessible at <http://www.dnr.state.oh.us/Portals/7/pubs/reports/Bellevue_Final_Report.pdf> .

American Geological Institute

- ◆ *Living With Karst—A Fragile Foundation*, AGI Environmental Awareness Series, no. 4, accessible at <<http://www.agiweb.org/environment/publications/karst.pdf>> .











US National Grid

Grid Zone Designation

Datum = NAD 1983, 12,000-m USNG
Final map series created June 2011

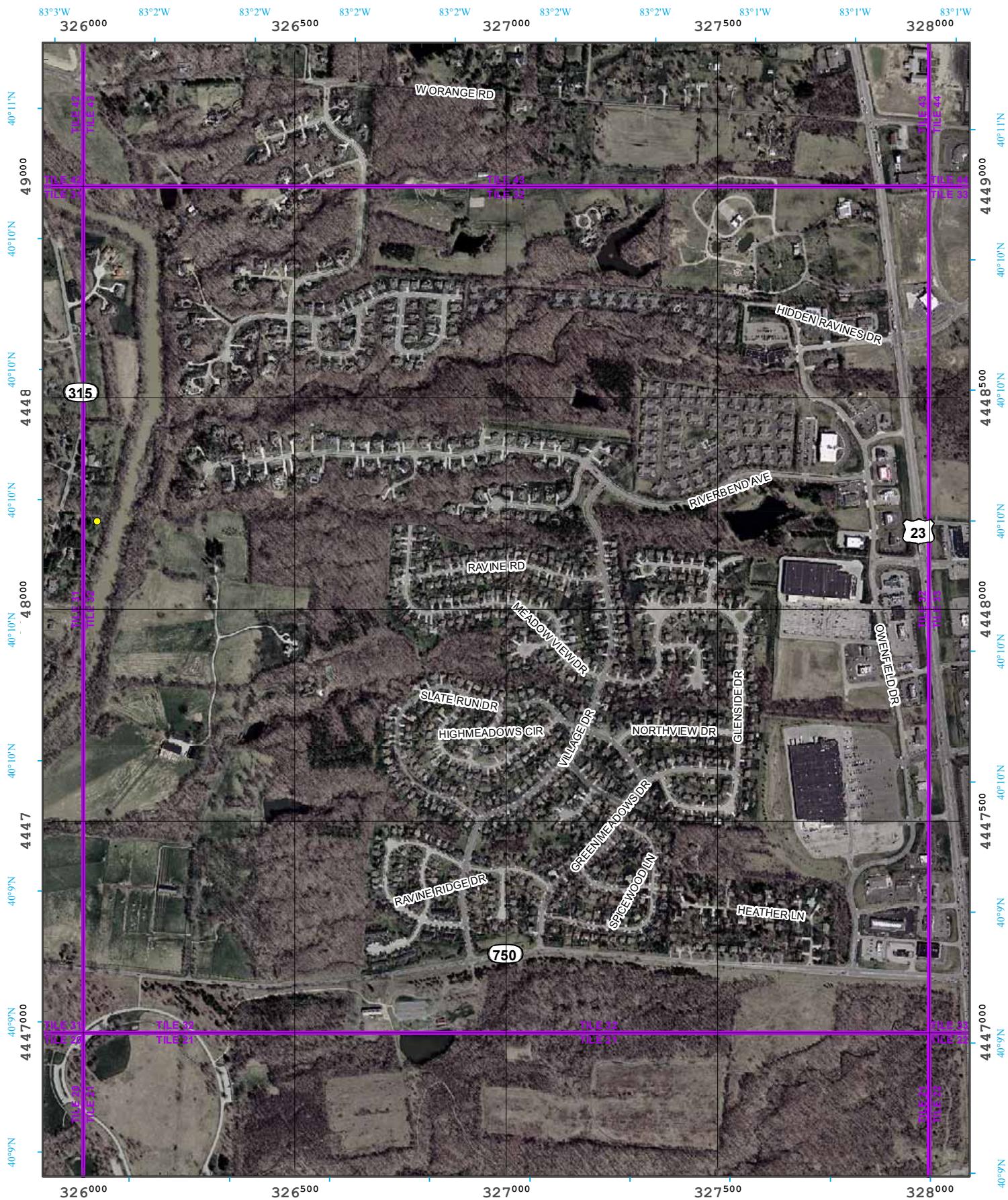
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First Feature









83 ZW

Grid Zone Designation

100,000-m Square ID

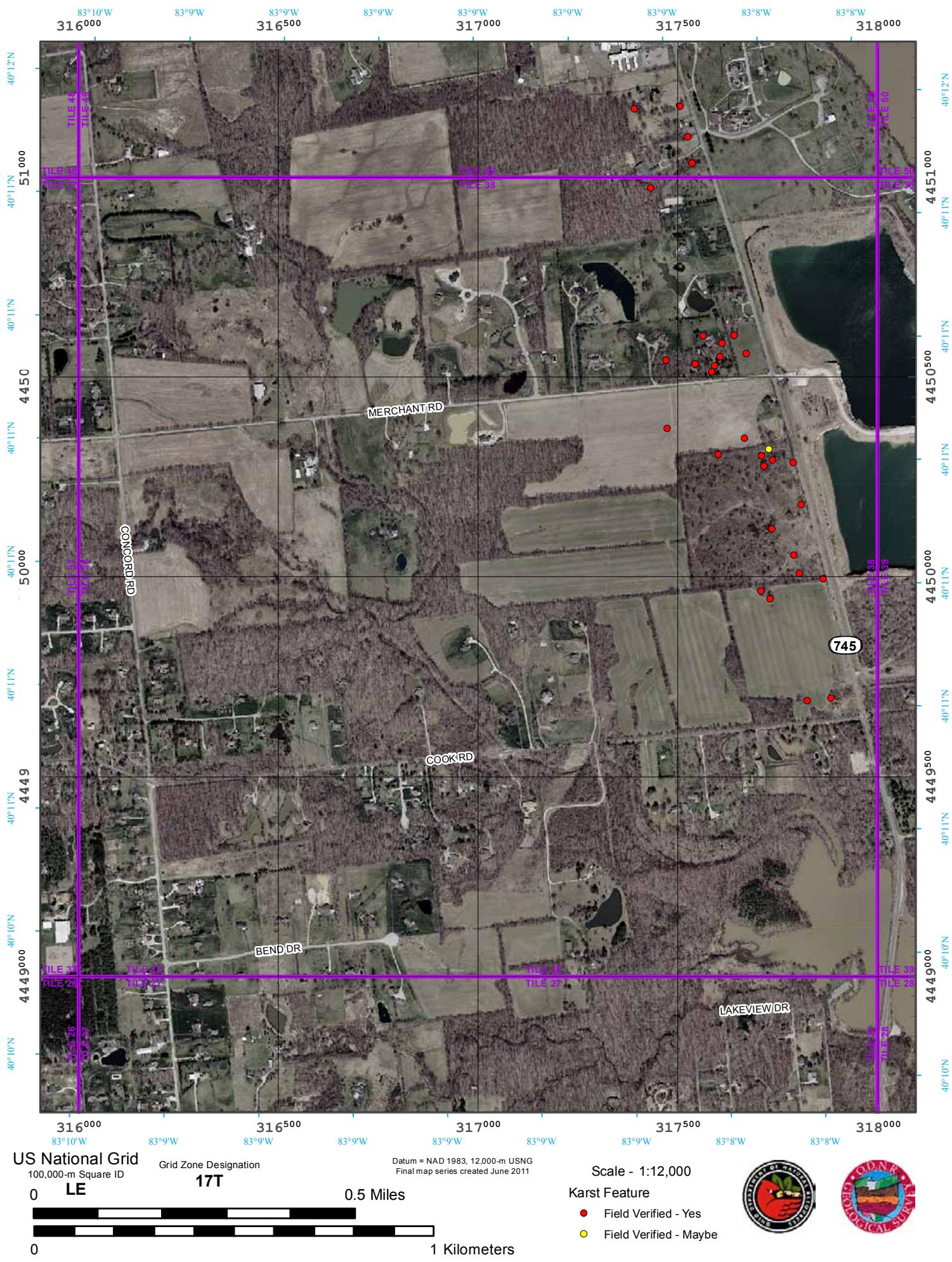
One Des

Datum = NAD 1983, 12,000-m USNG
Final map series created June 2011

Scale - 1:12,000

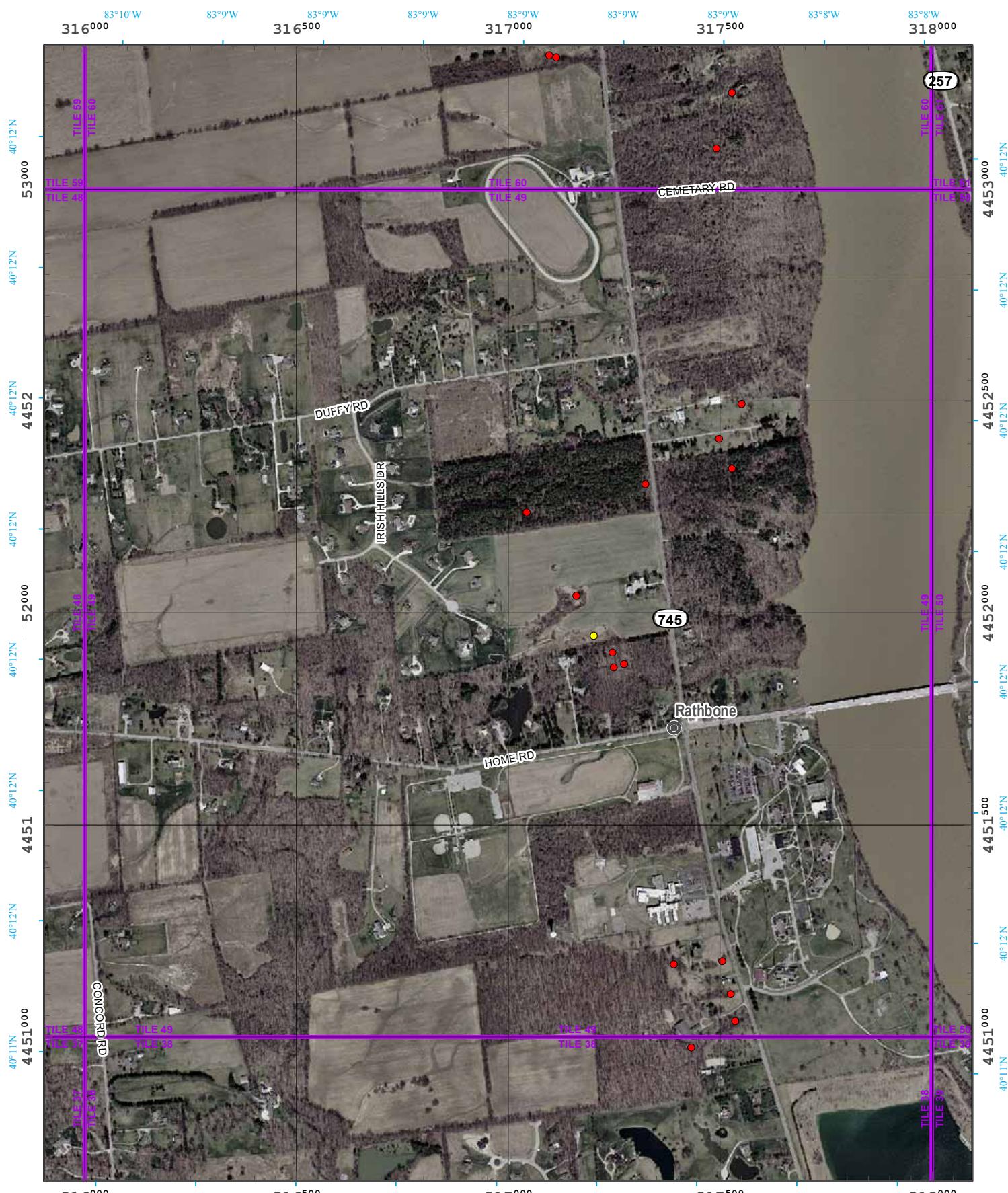
First Feature











US National Grid

100,000-m Square ID

Grid Zone Designation

17T

0.5 Miles

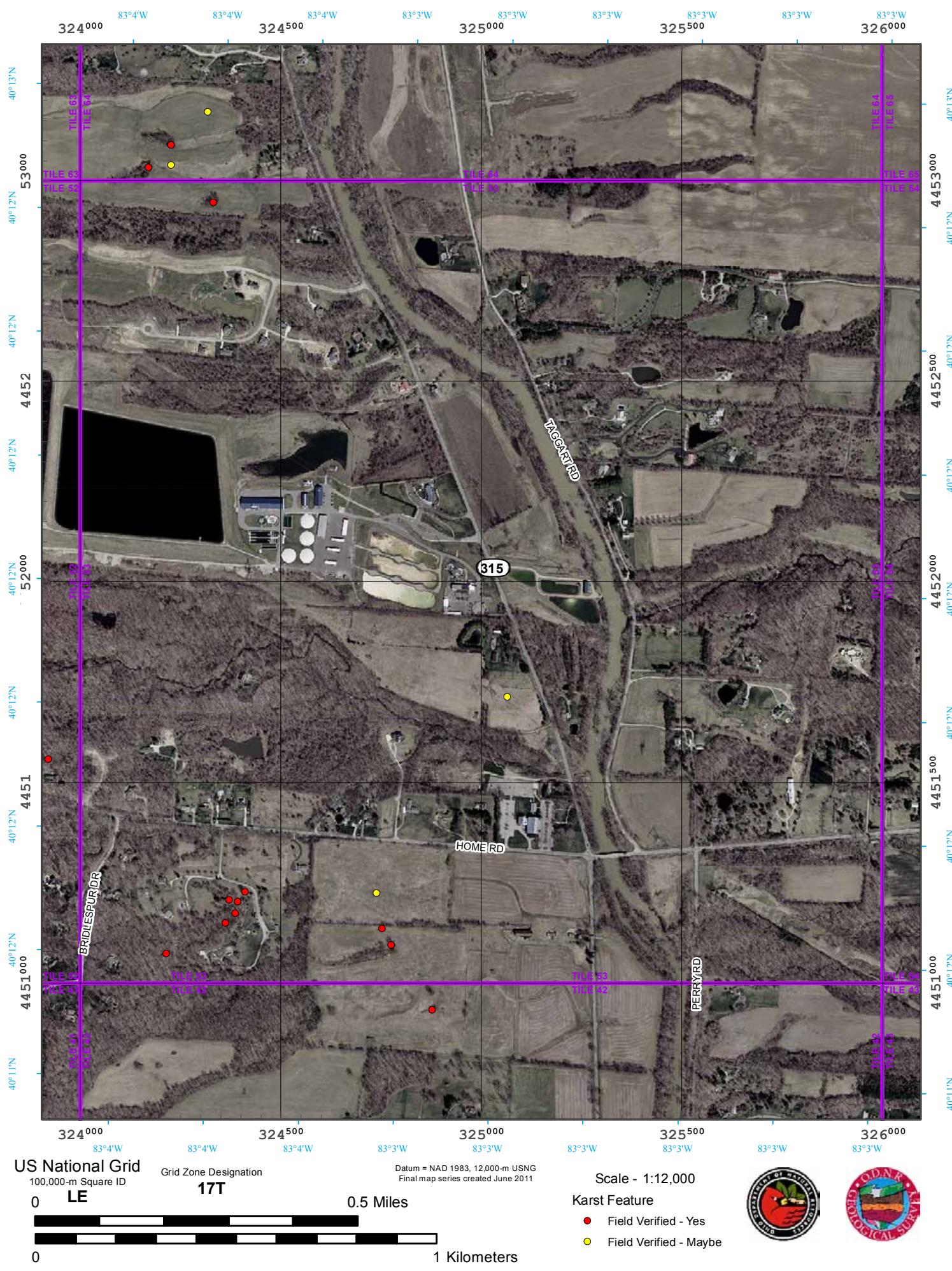
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Final map series created June 2011

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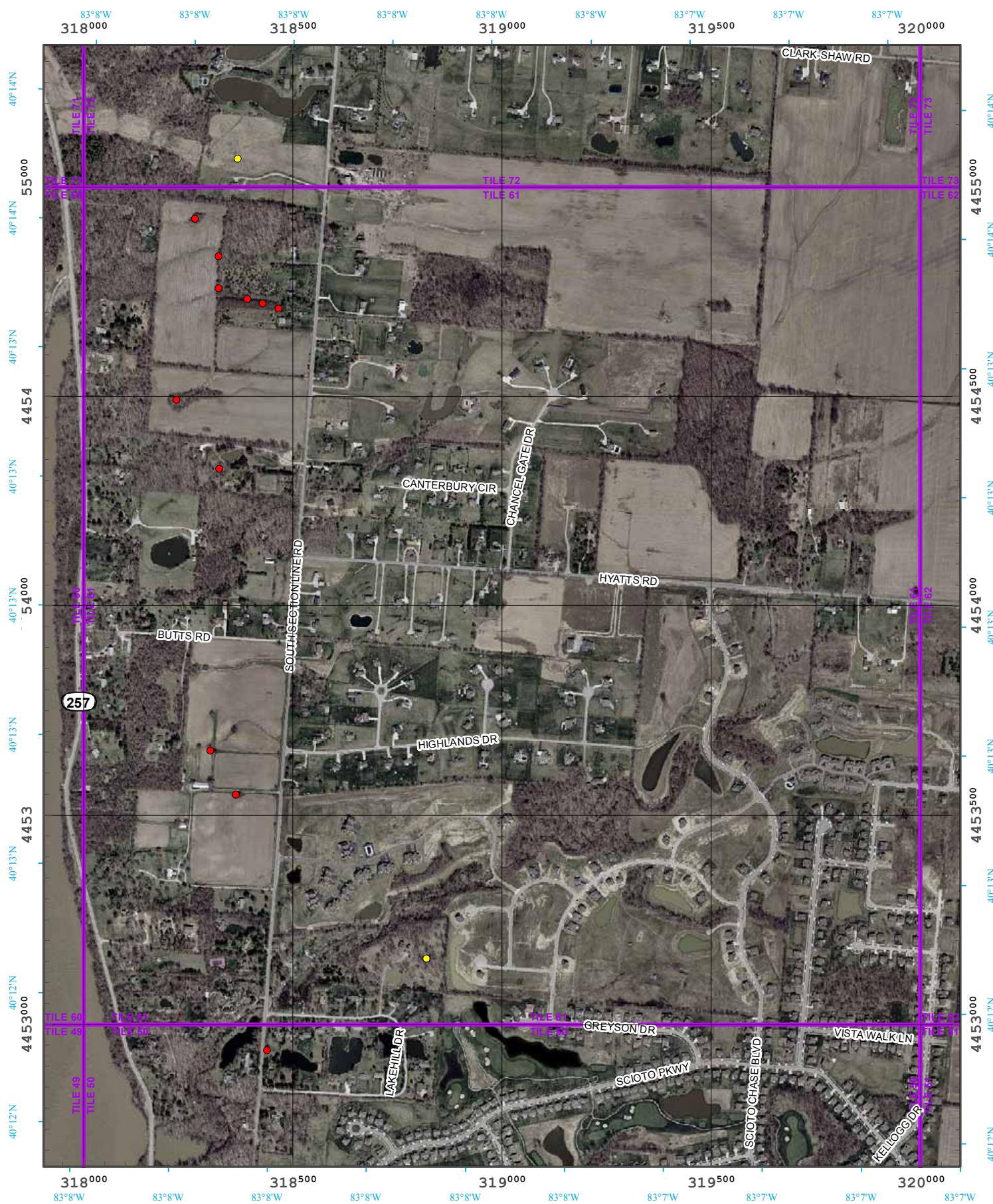












US National Grid

100,000-m Square ID

Grid Zone Designation

17T

Datum = NAD 1983, 12,000-m USNG
Final map series created June 2011

0.5 Miles

0

1

171

0.5 Miles

100

1 Kilometers

Scale - 1:12,000

- Field Verified - Yes
 - Field Verified - Maybe





US National Grid

100,000-m Square ID

Grid Zone Designation

17T

0

83°15'W

83°15'W

83°15'W

83°15'W

83°14'W

308⁰⁰⁰308⁵⁰⁰309⁰⁰⁰309⁵⁰⁰310⁰⁰⁰

83°15'W

83°15'W

83°15'W

83°14'W

83°14'W

40°13'N

40°14'N

40°14'N

40°14'N

40°14'N

44°55'N

44°55'N

44°55'N

44°55'N

44°55'N

40°14'N

40°14'N

40°14'N

40°14'N

40°14'N

56⁰⁰⁰4456⁰⁰⁰4456⁰⁰⁰4456⁰⁰⁰4456⁰⁰⁰

40°14'N

40°14'N

40°14'N

40°14'N

40°14'N

4457⁰⁰⁰4457⁰⁰⁰4457⁰⁰⁰4457⁰⁰⁰4457⁰⁰⁰

40°15'N

40°15'N

40°15'N

40°15'N

40°15'N

57⁰⁰⁰57⁰⁰⁰57⁰⁰⁰57⁰⁰⁰57⁰⁰⁰

40°15'N

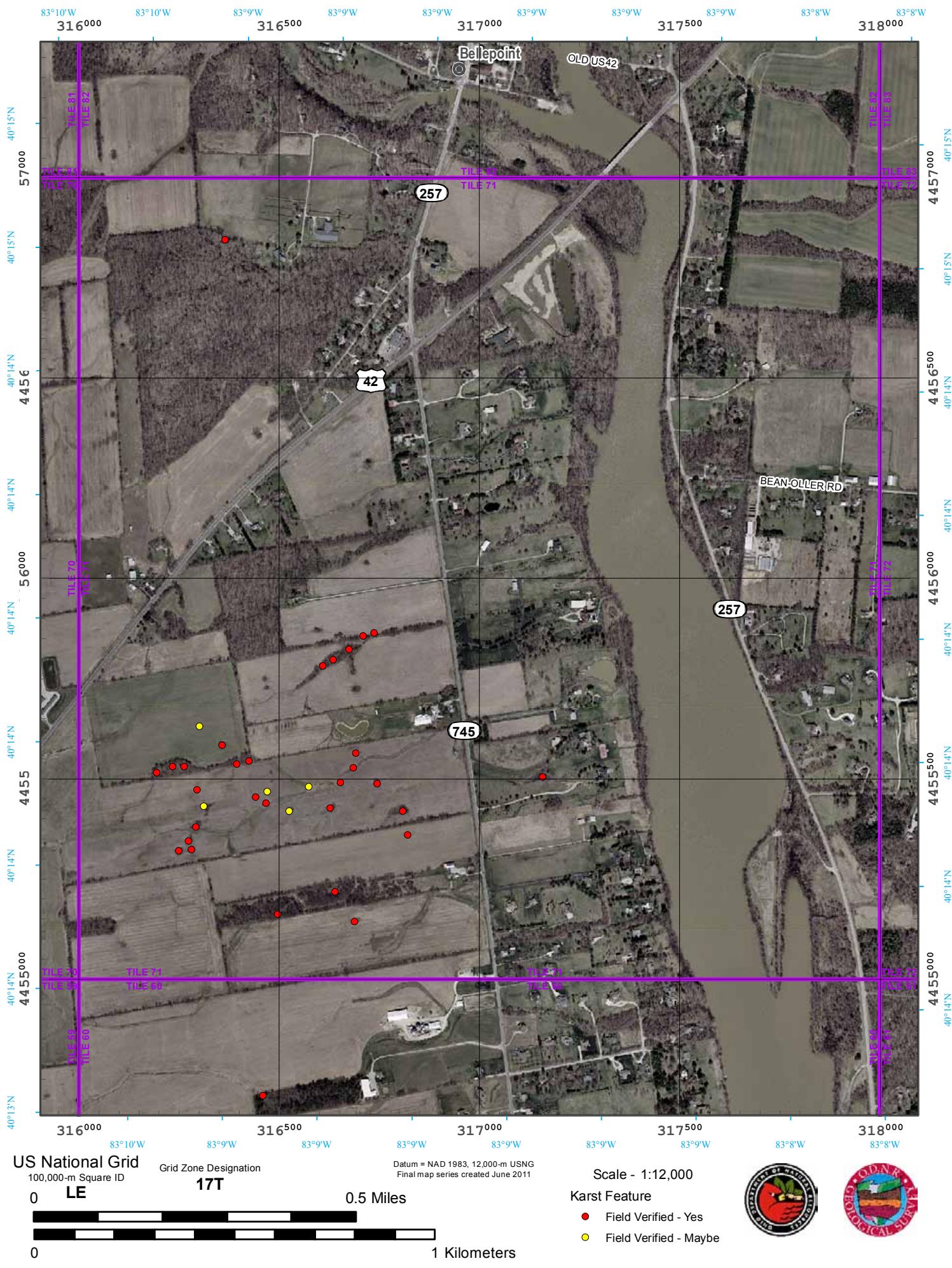
40°15'N

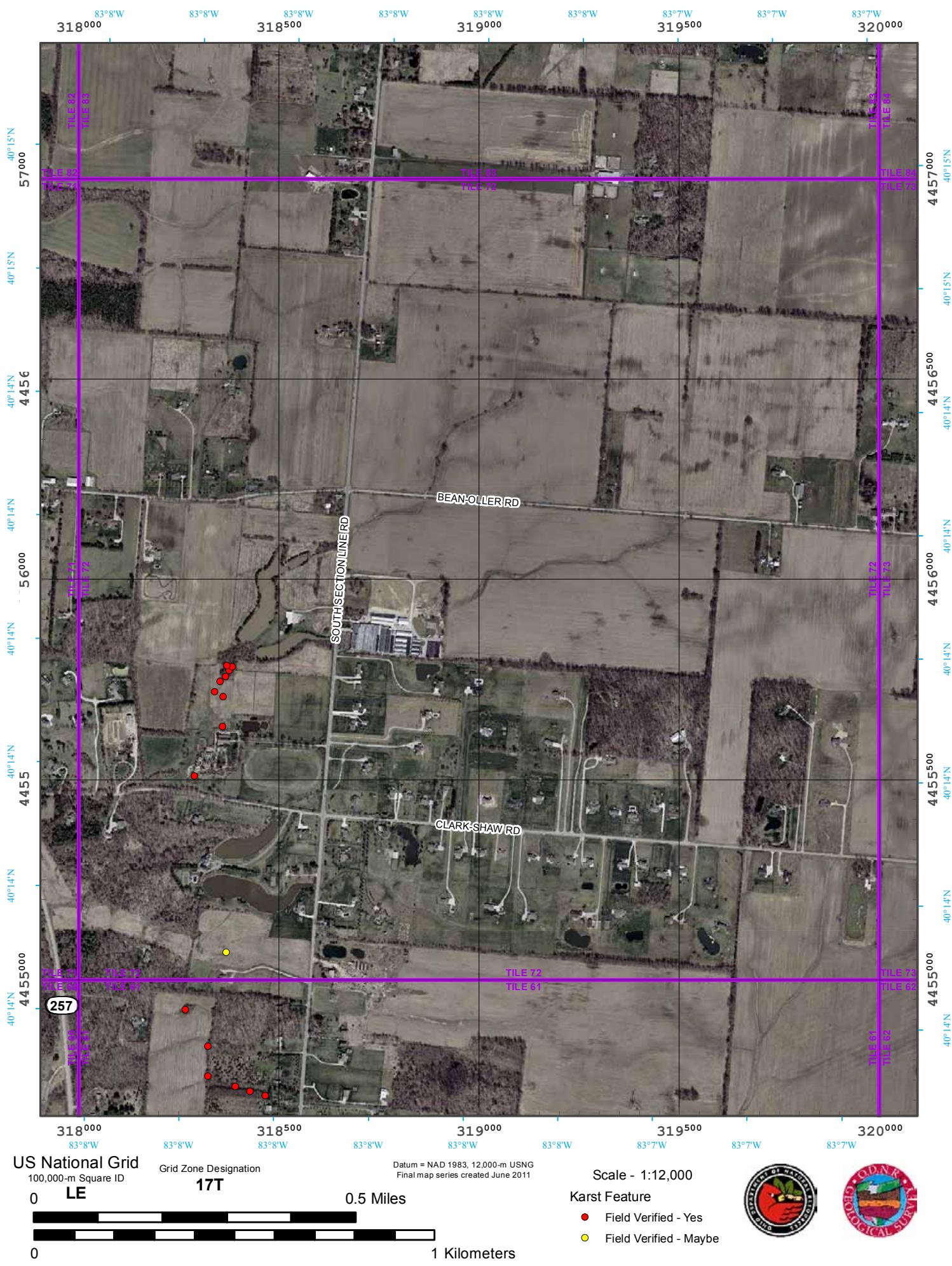
40°15'N

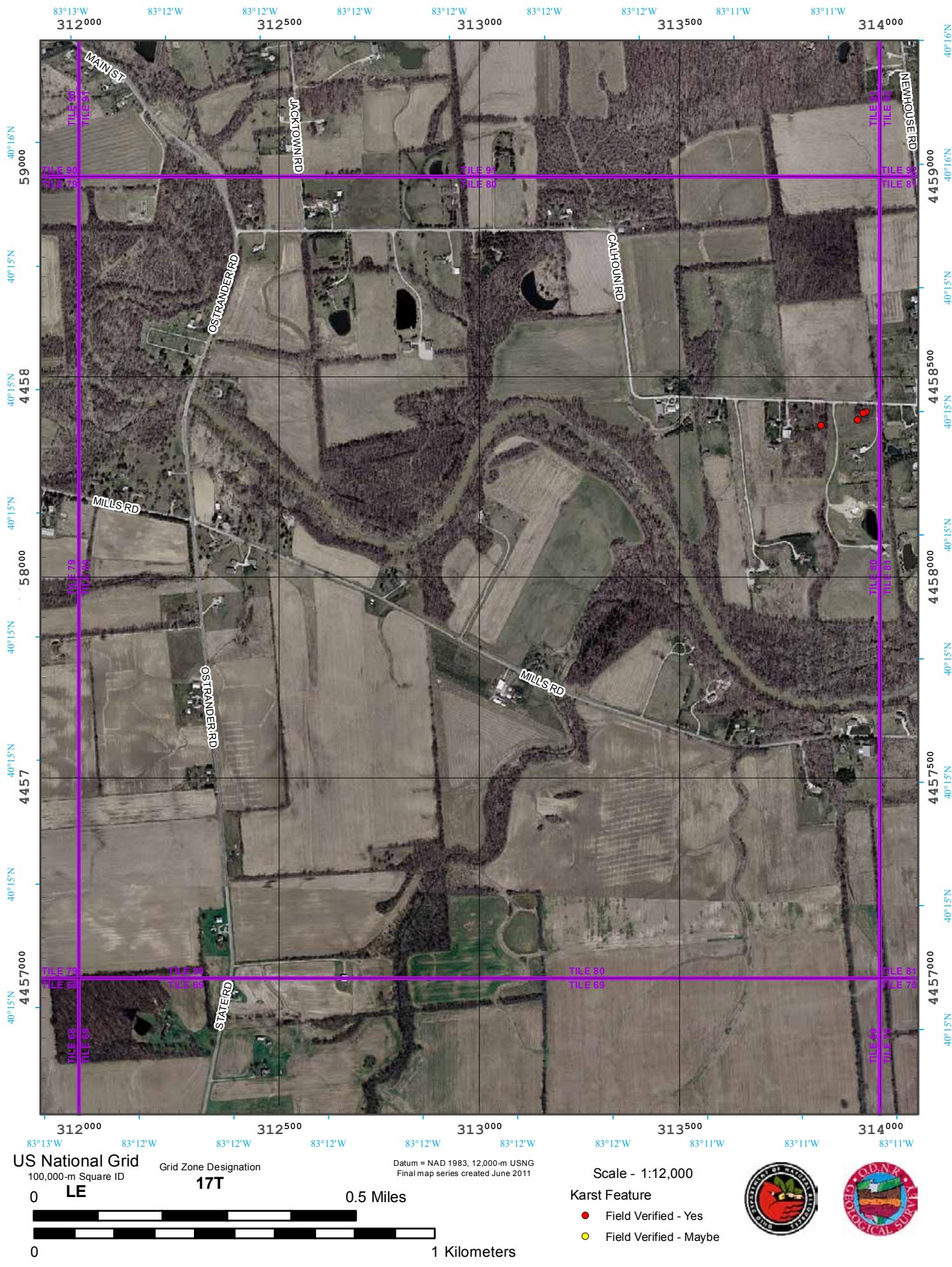
40°15'N

40°15'N

40°14'N









83 10 W 83

Grid Zone Designation

3 National Grid

Datum = NAD 1983, 12,000-m USNG
Final map series created June 2011

17T

100,000

0.5 Miles

U

1

1

0

1 Kilometers

Scale - 1:12,000

- Field Verified - Yes
 - Field Verified - Maybe











83 10 W

100,000-m² Square ID:

Grid Zone Designation

17T

0.5 Miles

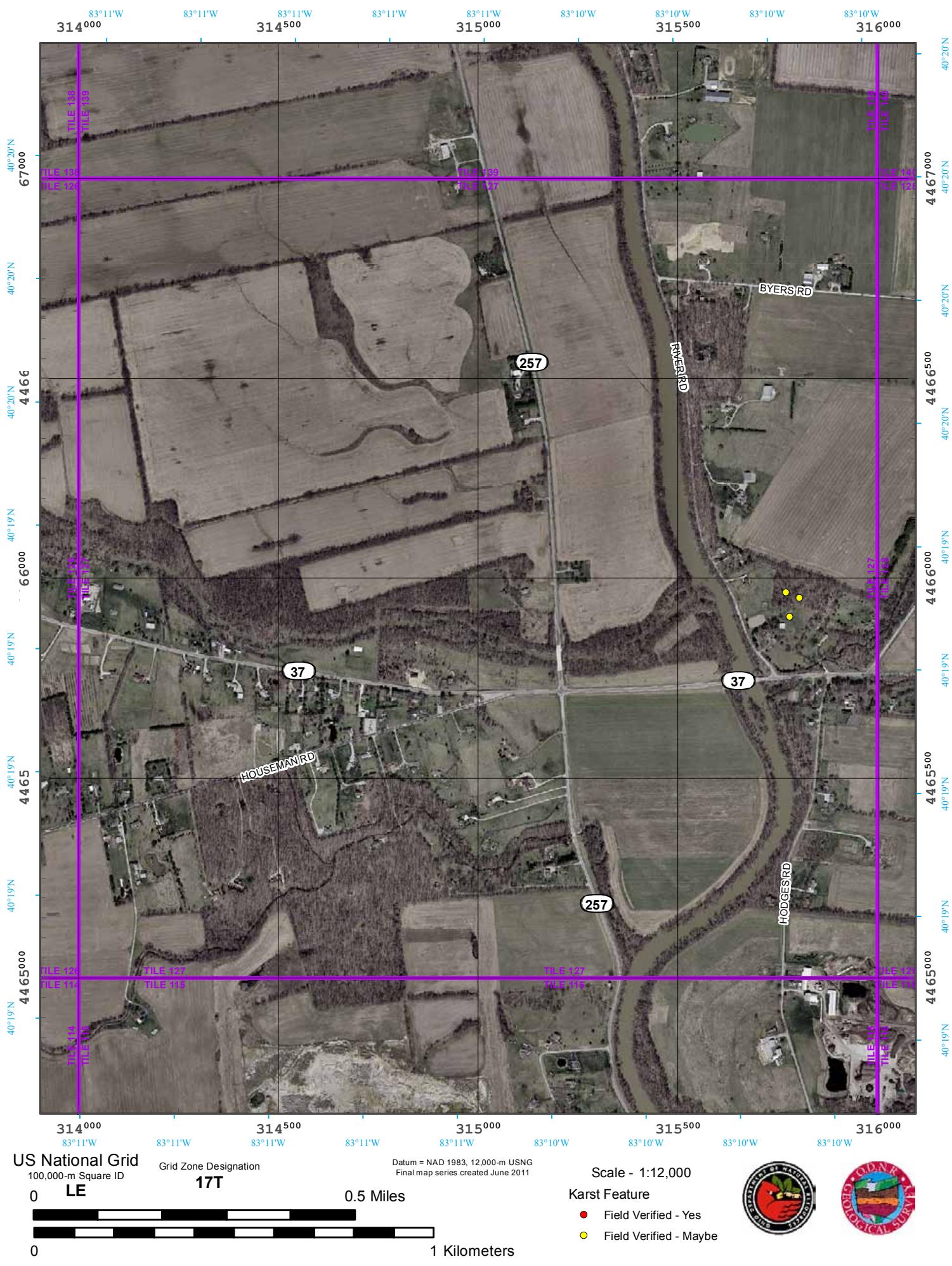
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Final map series created June 2011

Scale - 1:12,000

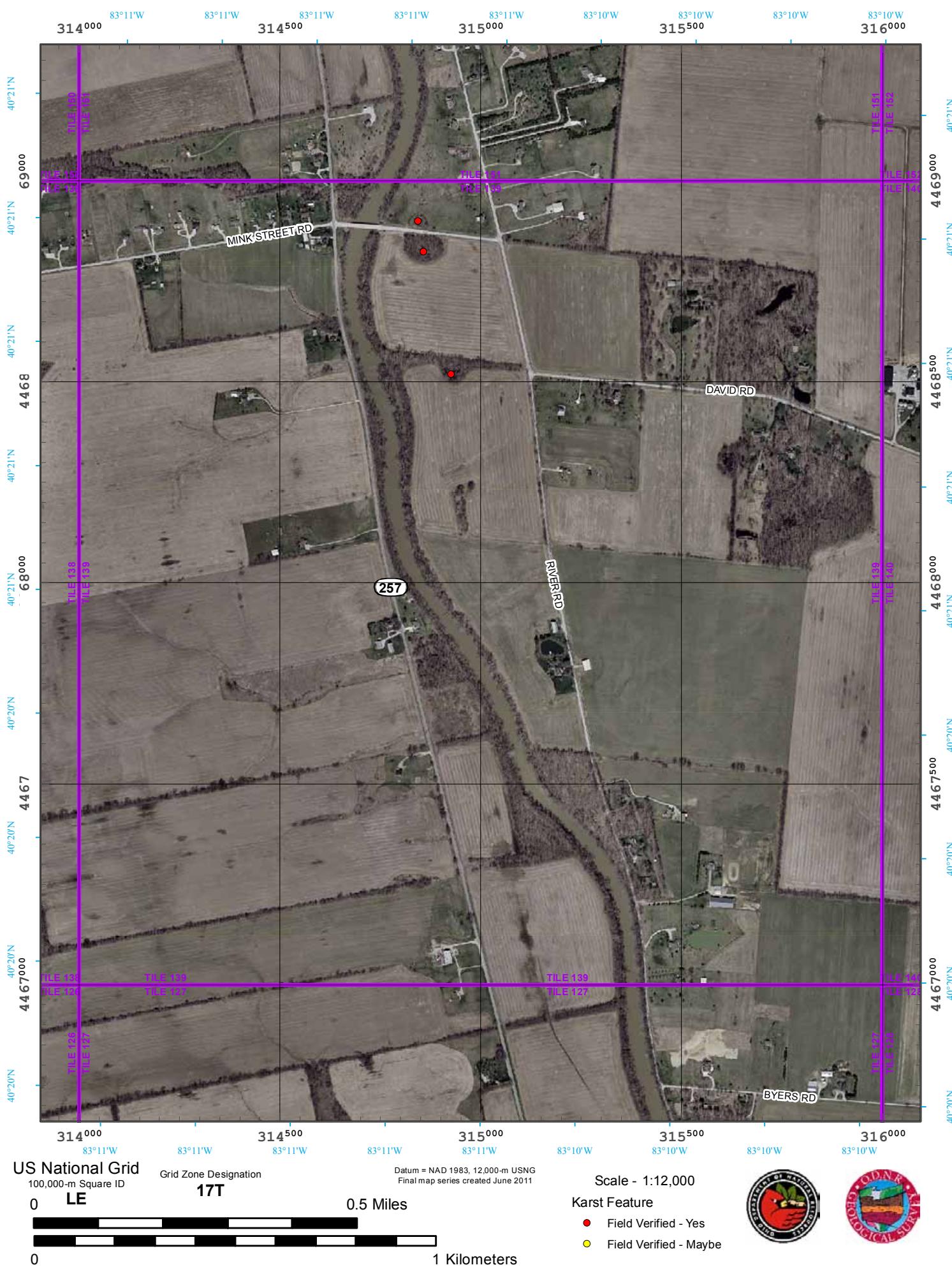














83 10 W

100,000-m² Square ID

Grid Zone Designation

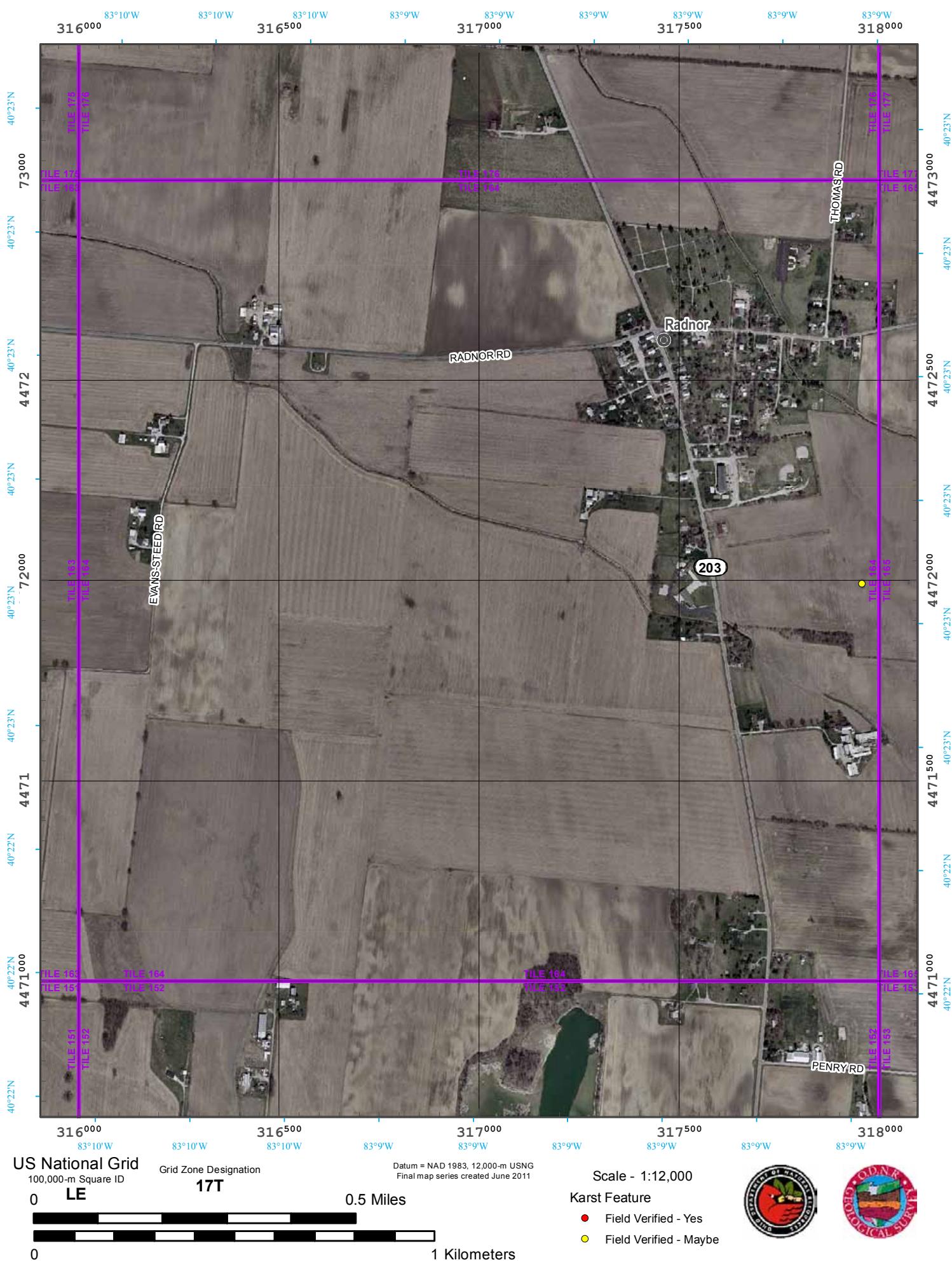
17T

0.5 Miles

Datum = NAD 1983, 12,000-m USNG
Final map series created June 2011

Scale - 1:12,000





**US National Grid**

100,000-m Square ID

Grid Zone Designation

Datum = NAD 1983, 12,000-m USNG

Final map series created June 2011

0

LE

17T

0.5 Miles



1 Kilometers

Scale - 1:12,000

Karst Feature

- Field Verified - Yes
- Field Verified - Maybe



